

July 18, 1994

3325 Perimeter Hill Dr.
Nashville, TN 37211
615 333 0630
Fax 615 331 4715Mr. Ken Richardson
CSX Transportation
500 Water Street
Jacksonville, Florida 32202Re: Information on the Practice of Geotechnical
Engineering Relative to Slope Stability

Dear Mr. Richardson:

Per our telephone conversation on Friday, July 15, 1994, presented herewith is a general description of geotechnical engineering practice as it might pertain to the situation described at your Radnor Yard in Nashville, Tennessee.

GENERAL DESCRIPTION OF RADNOR YARD SITUATION

Very limited and only general information was provided regarding the work proposed at Radnor Yard. That information, however, is sufficient to permit a general discussion of the practice of geotechnical engineering and appropriate investigations to address slope stability issues.

We understand that the US EPA and others, intend to make an excavation adjacent to your mainline track at Radnor Yard. The excavation will be for environmental restoration of a listed site. We do not have any information about the size and depth of the proposed excavation. The excavation will, however, encroach upon the base of the fill slope that supports your mainline track. The track embankment is 25 to 30 feet high along the proposed excavation area. The encroachment limits and the length of the affected area are unknown to the writer.

The mainline track is heavily traveled with approximately 1 train per hour. Disruptions to rail traffic are unacceptable and, obviously, movement or failure of the embankment adjacent to this excavation could be disastrous.

GEOTECHNICAL ENGINEERING CONSIDERATIONS

The practice of geotechnical engineering involves the investigation, testing and analysis of foundation materials (soil, rock and ground water) as they might relate to the performance of a constructed project. The purpose for conducting geotechnical engineering studies is to understand the geologic setting and subsurface conditions at a specific site and to assess the impact that such conditions may have on the proposed work. The level of detail and the extent to which a specific site is studied depends largely on the complexity of the site, the amount of available information about the site, and the level of risk associated with the proposed construction

CSX Transportation
Page 2
July 18, 1994

activities. Remote sites which have little chance of impacting adjacent structures, or where the performance of the surface facility is not critical, may warrant little or no geotechnical engineering investigation or analysis. Conversely, sites adjacent to, or involving critical structures, may warrant fairly detailed study and the design of appropriate precautionary measures.

Geotechnical studies typically involve drilling and sampling of the site soil and bedrock to define conditions and obtain samples for possible laboratory testing. Testing normally includes standard soil classification testing and strength testing to define engineering properties. If needed, geotechnical drilling, sampling and testing can be performed following strict environmental protocol to provide quantitative data about the presence or absence of hazardous, or environmentally sensitive materials. Based on the results of the subsurface investigation and testing programs, a geotechnical engineer or engineering geologist normally provides recommendations relative to the proposed work.

With regard to the stability of excavations, it is important to understand a number of factors as follows:

1. The generalized subsurface conditions and engineering properties of the adjacent materials;
2. The level of the normal ground water table, potential ground water level fluctuations, and potential locations of perched water;
3. The size, shape and depth of the excavation and locations of adjacent structures;
4. The period of time over which the excavation will be required and whether the excavation is permanent or temporary;
5. The magnitude and duration of potential surface surcharge loads adjacent to the excavation;
6. The tolerance to movement or settlement of structures adjacent to the excavation; and,
7. The nature of any vibrations affecting the site.

At Radnor Yard, it appears that the excavation will be sufficiently close to the mainline track to warrant a thorough analysis and design. A failure of the embankment could be catastrophic. A typical geotechnical engineering study would likely include drilling,

OGDEN

CSX Transportation
Page 3
July 18, 1994

17 7 0411

sampling, and testing of the embankment material and underlying fill or natural overburden. If bedrock is relatively shallow, then the borings should probably be advanced to, and possibly into, the bedrock. Otherwise, the borings should be extended well below the bottom of the proposed excavation. The number and locations for drilling will be highly dependent on the size of the excavation, the length of the affected area, and the complexity of the site. Typically, borings along the railroad embankment would be made at 50 to 200 foot intervals. Borings are also warranted at the top, middle and toe of the slope to better define conditions. During drilling, piezometers can be installed to monitor ground water levels. Depending on the quality of available site maps, a location and topographic survey of the site may also be warranted to define site features and locate the borings. As noted previously, this site may require that drilling activities be performed following environmental protocol to provide additional data relative to potential site contaminants or to reduce exposure to environmental hazards.

Following drilling, the recovered soil and rock samples should be visually reviewed and classified by a geotechnical engineer or engineering geologist. Selected samples should also be subjected to standard laboratory index testing. Similarly, samples of the embankment and foundation materials should be subjected to laboratory shear strength testing.

After the field investigation is completed and the laboratory test results are available, a slope stability analysis should be performed to assess the safety of the embankment relative to the excavation. Depending on the excavation limits and the results of the stability analysis, engineering recommendations may include criteria for the permissible slope inclination or for excavation and slope support systems. If needed, support systems should be designed and specified by a registered professional engineer and the engineer should observe construction of the system to ensure compliance with the design intent.

Ogden appreciates this opportunity to assist CSX Transportation. If you have any questions or comments, please call at your convenience.

Respectfully submitted,

Ogden Environmental and Energy Services



Bernard H. Voor, III, P.E.

Fax: Ms. Karen Koster Burr
CSXT - Legal Department
(904) 359-1248

OGDEN